Emerald Lake shows beautiful flowers, a variety of insects, and hints of climate change

by Ed Berg

As I reported last week, we recently completed a six-day field study of the Refuge's southern extremity in the mountains of Kachemak Bay. Collecting the plants and insects was an important part of our mission, as well as inventorying the wildlife. We have been wanting to upgrade our modest plant collection at the Refuge headquarters, and this seemed like the perfect opportunity. In six days of collecting at Emerald Lake above Grewingk Glacier we filled four plant presses with dozens of species, with Pam Russell and Candy Cartwright focusing on the flowering plants, while I worked on the mosses and lichens.

Spring was a bit late when we arrived in the last week of June, and I was at first worried that we had arrived a week or two prematurely before the peak of flowering. False hellebore spikes were less than a foot tall, and fireweed shoots were mostly in the early red stage and only three inches tall. Nevertheless, on sunny sites salmonberries, blueberries, and nagoonberries were in full bloom and promised bountiful picking in late July and August. Mountain marigolds were in bloom along every streamlet, even those with residual snow banks. We saw lots of yellow violets, as well as purple Alaska violets. Indian paintbrush was in flower, as were wooly louseworts and yellow buttercups of various kinds. Burnett was probably the most common herbaceous plant, although it was not yet in flower.

The prize flower—found by Candy Cartwright on a gravelly moraine—was a small primrose *Douglasia (Androsace) alaskana*. I had never seen anything like this in more than 20 years of plant picking on the Kenai, and it definitely had me stumped. It had a tight central clump of hairy leaves about an inch tall and eight wire-like three-inch stems arcing out of the central clump. Each stem had a single seed head at its tip; the petals were long gone so we couldn't tell their color. When we returned to the lab Candy keyed the plant out with Hulten's *Flora of Alaska* and sure enough, there it was on page 746. This is a showy little guy that would look good in a rock garden, and Candy plans to try to germinate some of the many tiny seeds.

I collected dozens of mosses and lichens—enough to keep my evenings busy for a good part of the winter. There are lots of crustose lichens on the rocks up in the mountains, which I collect with a hammer and cold chisel. Many boulders were encrusted with bright patches of the yellow-and-black Rhizocarpon lichen. Glacial geologists use this lichen to estimate the minimum number of years that a rock surface has been exposed after a glacier has retreated. In Kachemak Bay, for example, circular patches of Rhizocarpon grow at a slow but steady rate, taking about three years to add one millimeter of diameter. At this rate a patch the size of quarter represents about 60–70 years of growth. The largest patches I saw were two inches (50 millimeters) in diameter, indicating that the ice had pulled back from the Emerald lake valley at least 150 years ago. (For a picture of Rhizocarpon see http://www.lichen.com/bigpix/Rgeographicum.html).

The pit traps that we deployed for catching voles and shrews turned out to be much more effective for catching ground beetles. We brought along our insect collecting bottles and nets, and caught quite a few beetles in the 15-inch deep funnel-shaped pit traps, that were set flush with the ground surface. We used our nets to sweep the bushes and flowers, and quickly collected a great variety of midges, flies, moths, and butterflies. This winter we will make preliminary identifications of the insects and then send them off to be verified and archived at the University of Alaska Museum in Fairbanks.

One of my interests in collecting insects is to begin building a baseline inventory of common species for monitoring climate change. Beetles for example are very good thermometers. Each beetle species has its preferred range of temperature. If you look at 20 or 30 species in an area, you will see a range of several degrees where they all overlap. Beetle paleontologists and archeologists use this method to estimate the growing season temperature in deposits thousands of years old. In the case at hand I want to track changes in the kinds and numbers of insects as the climate of the Kenai Peninsula warms and dries in future years.

To look at climate change that has already taken place, I cored several big Sitka spruce trees above Emerald Lake. About 50% of the relatively few spruce trees up here are dead from spruce bark beetles, especially the larger trees. I was able to use my increment borer (a threaded tube) to extract wood core samples from trees as large as 28 inches in diameter. These trees were all growing at treeline, but the younger trees were growing especially vigorously with wide rings. This indicates that they could be growing higher; they are not growing at their limit of stress or at "physiological treeline." I have seen this pattern at other treeline spruce sites around the Kenai Peninsula, and it indicates that treeline is rising, and indeed has been rising for more than 100 years.

Our tree-ring studies with mountain hemlocks at treeline indicate that summers on the Kenai have generally been warming since the 1810s. Furthermore, I have never seen a cohort of dead trees at treeline on the Kenai, which would indicate that a cold period had pushed treeline back down. We have had brief cold periods in the last two centuries, but they apparently have never been cold enough to reverse the general rise of treeline.

Nevertheless, if the trees are growing well at treeline, why aren't they growing higher up than they are presently growing? Is something limiting their upward mobility? Seed dispersal studies have shown that most spruce seeds don't go very far. Despite being wind dispersed, most seeds fall within a radius equal to the height of the tree. That is why they are often in clumps—they are growing near their seed mothers. Climatewise, they could be growing higher, but they stay close to home. Like a lot of us, they could move up the hill faster, but after all, what's the rush—in the grand scheme of things?

Ed Berg has been the ecologist at the Kenai National Wildlife Refuge since 1993. For more information about the Refuge, visit the headquarters in Soldotna, call (907) 262-7021. Previous Refuge Notebook columns can be viewed on the Web at http://kenai.fws.gov.